CLASS DESK BRIEF
for
ATRB
CREW SYSTEMS
TECHNICAL REQUIREMENTS

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NAVAIR

PMA-202

To provide Navy and Marine Corps Aircrew with systems that prepare them for, sustain them during, protect them from threats inherent to, and assist in emergency survival and recovery associated with, naval flight operations.

ACQUISITION **OWNERSHIP**

FULL LIFE CYCLE SUPPORT

ACAT PROGRAMS: 5 (3 ACAT III, 1 IVM, & 1 IVT)

ABBREVIATED ACQUISITION PROGRAMS: 4

OTHER PROGRAMS: 15

TOA: FY04 = $57.5M

NAVAL AVIATION TECHNOLOGIES

Systems Engineering Team

- CDR T.J. Wheaton – APMSE
- John Mountjoy – Deputy APMSE
- John Harwood – Deputy APMSE for 4.6
- Configuration Manager (TBD)
- Rita Morrison – Service Support & ECP Control

RESPONSIBILITIES

- **Class Desk is key integrator of:**
  - T&E
  - R&M
  - Cost
  - Human Factors
  - Training Systems
  - Survivability

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SPECIFIC DUTIES

- **Ensure Integration of Engineering Specialties Across IPTs**
- **Maintain Internal Communications with IPT's**
- **Ensure Current and Accurate Documentation of Engineering Baseline**
- **Maintain Disciplined Risk Management Process**

SPECIFIC DUTIES

- **Oversee Red Stripe/Bulletin Process**
- **Manage Execution Of Flight Clearance And TD Process**
- **Establish And Track Technical Performance Measures**
- **Participate In Tech Portion Of:**
  - Tradeoffs, RFPs, Source Selections, And ECPs

SUMMARY

- **A Class Desk Is Performing Their Duties Properly If Their Decisions And Tradeoffs Reflect:**
  - Concern For Safety Of Users
  - Operational Effectiveness
  - Timely & Economic Acquisition
  - Adequate Logistics Support

. . . And they communicate, communicate, communicate . . .

PMA-202
AIRCREW SYSTEMS

TECHNOLOGY NEEDS
For Aircrew Systems and Aviation Life Support

Requirements Driven

- **OPNAV N78 Resource Sponsor**

2003 ALSS Operator's Advisory Group

ALSS OAG TOP 10	
1. SURVIVAL RADIOS	6. EJECTION SEATS (SIP)
2. SEAT ENDURANCE	7. COMMUNICATIONS
3. SURVIVAL VESTS	8. NOISE REDUCTION
4. CRASHWORTHINESS	9. ANTI-EXPOSURE SYS
5. HMD/ NVD	10.FLEET SUPPORT

OPNAV Aircrew Systems Roadmap

ALSS ROADMAP GOALS

1. Reduce Life Cycle Costs thru development of Common Systems
2. Enhance Aircrew Safety, Effectiveness, and Accommodation
3. Keep Pace with Enemy Threats and Operational Hazards

- **SEVEN AREAS OF EMPHASIS**:

1. Integrated Crew Stations, including physiological monitoring
2. Improved Escape capabilities, NACES & legacy systems
3. Crash Protection, dynamic and post-crash environment
4. Helmet-based Situational Awareness, 3D audio & tactile cueing
5. Mishap Avoidance technologies, alerts & intervention
6. Optimize ALSS and transfer of aircrew to the aircraft
7. Survival & Rescue gear; generic, compact and light

Possible Solutions & Recommendations

- Establish Focus at the Ensemble Level
  - **Task IPT's with Mission-Driven Ensemble Level Responsibilities**
    - "Head To Toe" For Rotary Wing
    - "Head To Toe" For TACAIRr
    - Same Possible For "Hybrid" Acft such as V-22, E-2, C-130
- Manage Configurations Accordingly
  - **Assign Systems Engineer and Logistician at the Ensemble Level**
- Integrate Development and In-service Engineering at the IPT Level
- Make Smart Decisions Regarding Commonality Across Communities
  - **What's Best for TACAIR may not be Best for Rotary Wing**
  - **Different Missions and Platforms Require Different Solutions**

HARD TO SOLVE PHYSIOLOGICAL THREATS

HUMAN PERFORMANCE TRADE-OFFS

CHEMICAL-BIOLOGICAL PROTECTION

- Challenges from heat retention, endurance, comfort, visibility, communication, hydration, etc.
- Integration with aircraft & other ALSS

LASER EYE PROTECTION

- threats from entire EM spectrum, including entire visible spectrum

NAVAIR AIR-4.1 / ONR Warfighter Near-Term Initiatives for Iraq/Afghanistan

1. Improved Wound Treatment Systems *
2. Seat Comfort/Ergonomics, Crashworthiness
3. Improved Ballistic Hard-Armor Inserts
4. Improved Endurance/Ergonomics for Ejection-Seat Equipped Aircraft
5. Night Vision for Evaders
6. In-Transit Hydration Systems Passengers in Transport-Class Helicopters

NAVAIR AIR-4.1 / ONR Warfighter Near-Term Initiatives for Iraq/Afghanistan

- **Active Cooling Vests [per US Army] *
- **Improved Hydration System for Tactical Aviators *
- **Supplemental Ballistic Protection for Extremities (Arms/Legs) *
- **Advanced Bladder Relief Device (ABRD) *
- **Low-Signature Defensive Weapons for Aviator Escape/Evasion *
- **Stabilized Binoculars (STABINO) for Tactical Jets**

BACK UP SLIDES

Improved Wound Treatment
Insertion of Anti-Exsangination Agent Into Tactical and Rotary-Wing Seat Survival Kits, Survival Vests, and Life-Rafts

Deficiency

- **USN/USMC aviators and aircrew have very limited ability to treat injuries/wounds sustained from combat. Commercial systems of hemostatic agents can potentially address this deficiency.**
  - Exsanguination (i.e. bleeding-out) is the leading cause of battlefield deaths

Capability Gap

- **Commercial systems of chemical hemostatic agents can potentially address this deficiency, allowing the treatment of wounds and prevention of blood-loss for in-aircraft and post-mission application. Certain systems claim to be self-applicable using only a single-hand.**

Approach

- **Insert advanced-technology hemostatic wound-bandage systems into USN/USMC aircraft & man-mounted systems.**

Technology Maturity: Current TRL = 7

- At least three agents are either already approved for clinical use or have applications pending for Food and Drug Administration (FDA) approval.
  - **Rapid Deployment Hemostat (RDH) bandage (Marine Polymer Technologies, Danvers, MA)**
  - **QuikClot hemostatic agent (Z-Medica, Newington, CT)**
  - **TraumaDEX (Medafor, Inc., Minneapolis, MN).**
- Already in-use by US ground troops
- Integration into USN/USMC survival kits, life-rafts, and survival vests will be accomplished rapidly
- **3-Month Goal: TRL ⇒ 8 / 9-Month Goal: TRL ⇒ 9**

Z-Medica's Quik-Clot Battle-Pack for Ground Troops

Deliverables

- **3-Months: Competitive selection of optimal COTS/NDI system.**
- **6-Months: Completion of qualification-testing and integration into USN/USMC aircraft/aircrew systems.**

Cost and Milestones

Qualification-testing

- 3 months ($60K)

Integration with life-rafts, survival kits, vests, panel-mounted first-aid kits, etc.

- 6 months ($125K)

Procurement of hardware (individual and multi-place bandage systems)

- 6-9 months ($225K)

Total**: $410K / 9 mos**

Partial Funding Would Still Allow For Limited Execution of this Initiative

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Improved Cockpit Ergonomics for Extended-Duration Aviation Operations – Rotary-Wing USN/USMC Aircraft

Deficiency

- **Ergonomically poor seats decrease mission effectiveness of aircrew due to fatigue caused by back pain, buttock pain and numbness in legs during extended missions. Incorrect posture also increases risk of spinal injury during mishaps.**
- **Long-term use contributes to high rate of chronic back diseases among aviators**

Capability Gap

- **New cushion materials and seat design technology exist that increase comfort, reduce transmitted vibration, and enhance crash protection.**

Approach

- **Develop seat-cushion / back-pad systems to enhance ergonomics of existing seats, reduce vibration, and absorb crash energy. Adapt cushion for integration into each aircraft platform. Qualify the developed system dynamically/environmentally for use by Fleet.**

Technology Maturity: Current TRL = 6

- **Visco-elastic foams are readily available and in use. Need to evaluate best combination of various foams and contours for comfort, vibration damping and crash energy absorption.**
  - HACS air chamber cushion and other new materials are also available for evaluation. Need to evaluate these alternate materials for possible advantages when compared to visco-elastic foams.
  - COTS / NDI cushion systems will be evaluated as preferred short-term solutions.
  - **7-Month Goal: TRL ⇒ 8 / 9-Month Goal: TRL ⇒ 9**

COTS (Oregon-Aero) Cushion/Pad Systems

Deliverables

- **3-6 Months: Establish /identify / evaluate design(s)**
- **6-9 Months: Qualify seat-cushion/back-pad systems**
- **9-12 Months: Adapt/integrate designs for specific aircraft applications.**

Cost and Milestones

Obtain and evaluate commercial NDI samples. Modify for ground and flight testing in Navy aircraft. Perform comfort evaluation survey and analysis.

- 2-6 months ($300K)

Environmental and dynamic qualification of new cushion.

- 3-7 months ($250K)

Integration of new cushion into specific aircraft platforms.

- 5-10 months ($200K)

Delivery of retrofit kits (~1500) for operational acft.

- 9-15 months EDD ($600K)

Total**: $1,350K / 12 mos**

Partial Funding Would Still Allow For Limited Execution of this Initiative

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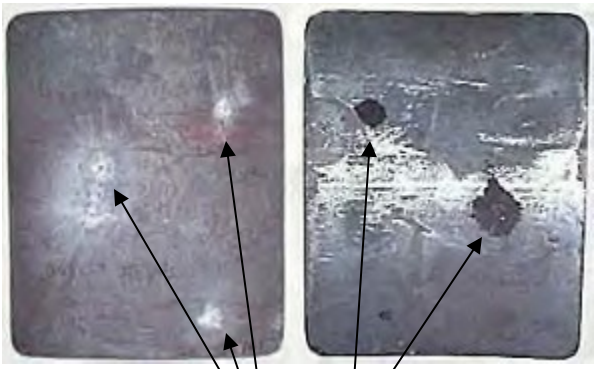
Lighter, More Durable, and More Producible .308-Capable Armor Inserts for USN/USMC Tactical Aviators' AIRSAVE Protective Vests

Deficiency

- **Current hard armor inserts used in ballistic-protective (AIRSAVE) vests for USN/USMC aviators/aircrew is heavy and fatiguing to users. These inserts have also proven to be surprisingly fragile in the operational environment. Due to complex manufacturing processes, supply cannot currently keep-up with the needs of the entire fleet.**

New Hard-Armor Insert



Armor Inserts Showing Impact-Marks of Point-Blank 0.308(AP) Rounds – Zero Penetration

Capability Gap

- **Insertion of newly developed improved hard-armor technologies. This can allow for equivalent protection at a lighter weight. New armor will be more durable to rigors of the real-world wartime environment and will be much more producible than current systems, thereby easing supply support challenges.**

Approach

- **Provide an avenue for obtaining improved (more durable, lighter weight) hard armor plates for fleet users, using emergent technology.**

Technology Maturity: Current TRL = 8

- Hard Armor has Already Been Prototyped
- Test and Evaluation Currently Planned for FY06, but Can be Easily Accelerated
- Integration: Improved Hard-Armor Inserts Will be Directly Insertable into Current AIRSAVE Vests
- Requirement for Protection against 0.308(AP) Rifle Rounds at Point-Blank Range Will Not be Compromised
- **6-Month Goal: TRL ⇒ 9**

Deliverables

- **3-Month - Qualify improved hard armor**
- **6-9Month – Limited quantity available to supply**

Cost and Milestones

Delivery of Prototypes of New Hard-Armor Inserts

- Completed

Test, Evaluation, and Qualification of Prototypes of New Hard Armor Inserts

- 3-5 months ($190K)

Delivery of Improved Hard Armor Inserts

- EDD 6-11 months (~1500 Units / $600K)

Total**: $790K / ~11 mos**

Partial Funding Would Still Allow For Limited Execution of this Initiative

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Enhanced Ergonomics & Increased Endurance/Mission-Effectiveness for USN/USMC Ejection-Seat Equipped Aircraft

Also submitted (but Not Yet Approved) by NAVAIR PMA-202 as POM-06 Issue

Deficiency

- **Ergonomically poor ejection seats decrease mission effectiveness of aircrew due to fatigue caused by back pain, buttocks pain and numbness in legs during extended missions.**
  - Increased risk of spinal injury during mishaps/ejections
  - Long-term use contributes to high rate of chronic back diseases among aviators
    - **Currently, missions have extended to 8+ hours**
    - **Aviators are buying unqualified commercial systems. Some are even making home-made cushions out of bubble-wrap and ordnance tape**

Oregon-Aero's "Softseat" System Proposed for the F/A-18A/B/C/D SJU-5/6 Ejection Seats

Capability Gap

- **New cushion materials and seat design technologies exist that increase endurance, reduce transmitted vibration, and enhance operational effectiveness**
  - Currently, USN systems use only old-style polyurethane pads/cushions
  - COTS systems are available from both Martin-Baker and Oregon-Aero

Deliverables

- **Immediately: Obtain COTS cushions from Martin-Baker and Oregon-Aero**
- **6-12 Months: Qualification tests reports**
- **8-12 Months: Hardware deliveries**
- **9-12 Months: Procure production assets**

Approach

- **Evaluate/approve COTS/NDI seat-cushion / back-pad systems to enhance ergonomics of existing seats, reduce transmission of aircraft vibration, and provide for support during ejection.**
  - Adapt cushion for integration into each aircraft platform
  - Qualify system dynamically/environmentally for use by Fleet

Technology Maturity: Current TRL = 6

- **Visco-elastic foams are readily available and in use**
- **COTS / NDI cushion systems will be evaluated as preferred short-term solutions.**
  - Testing is required to ensure ejection safety to prevent risk of spinal injury/paralysis
  - **6-11 Month Goal: TRL ⇒ 8 / 11-16 Month Goal: TRL ⇒ 9**

Cost and Milestones

Immediate: Obtain and evaluate commercial NDI samples from Martin-Baker and Oregon-Aero.

Qualification testing for Navy aircraft

F/A-18A/B/C/D	**- 6 months / $500K**
EA-6B & F-14A/B	**- 9 months / $450K**
AV-8B / TAV-8B	**- 11 months / $650K**

Integrated logistics for new cushion/pad systems

- 6-12 months ($90K)

Procurement/delivery of retrofit kits

F/A-18A/B/C/D (~350 units)	**- 8-11months / $180K**
EA-6B & F-14A/B (~550 units)	**- 11-14 months / $220K**
AV-8B / TAV-8B (~240 units)	**- 12 –16 months / $190K**

Total**: $2.28M / 8-12 months**

Partial Funding Would Still Allow For Limited Execution of this Initiative

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Evader's Night Vision Imaging System for Nocturnal Escape & Evasion by Downed USN & USMC Tactical Aviators

Deficiency

- **For obvious reasons, night movement is the best choice for evasive movement by downed aviators. However, with current equipment, this is impractical for our USN./USMC aviators/aircrew.**

Capability Gap

- **U.S. Naval Aviators do not have a post-ejection/post-crash night vision capability to aid in nocturnal escape & evasion maneuvers. Absent too, is an infrared illumination capability for fratricide avoidance and combat identification.**

Approach

- **Complete qualification testing for USN applications and update survival vest, SV-2 and AIRSAVE Type II, standard flight ensemble configuration to include ENVIS (M703E) with optional compass PVS-7B, P/N A3187430.**
- **The USAF is currently procuring these items for their aircrews.**

Technology Maturity: Current TRL = 7

- **ENVIS Commercial System**
  - Non-developmental item NSN: 5855-01-477-3241
  - USAF approved for flight survival vests -- small, lightweight and rugged
  - Water resistant / AA battery operation (40 hours)
  - USN configuration Wind Blast tested (successfully)
  - On-board covert signaling capability
  - GEN III gain & resolution with optional compass module
- **Alternately, ~40% less-expensive systems can be built-up using components from surplus ANVIS NVG systems (~$1.8M/500 units)**
- 3-Month Goal: TRL ⇒ 7 / 6-Month Goal: TRL ⇒ 9

Deliverables

- **Qualification and Technical Manual updates**
- **Flight Clearance**
- **Hardware: ENVIS (M703E) Monoculars with Optional Compass PVS-7B, P/N A3187430.**

Cost and Milestones

Man mounted - survival vest compatibility and systems integration. Qualification as Safe-for-Flight.

- 3 months ($30K)

Technical manual updates – IRAC and formal changes.

- 1 month ($12K)

Acquisition – 2,000 NVM units

- 6 months ($ 3.6M)

Total: $3.64M / 10 mos

Partial Funding Would Still Allow For Limited Execution of this Initiative

Lower cost would result if reprocessing of ANVIS NVGs is successful

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Improved Hydration Capability for Passengers Embarked Aboard USN/USMC Rotary-Wing Aircraft

Deficiency

- **During air transport of US Forces for remote operations (including air-assaults), passengers carry only limited amounts of personal water.**
- **In Afghanistan and Iraq, experience has shown that passengers often drink much of their personal water supply en-route, leaving their personal water supplies (canteens, camel-backs, bladders) nearly-exhausted upon arrival.**
- **This presents obvious risks to troops inserting into combat environments.**

Candidate System: Water-Bladder Currently Used in USMC Ground-Vehicles

Capability Gap

- **Establish common water supply for embarked assault-troops, allowing hydration of troops while en-route without exhausting their personal water supplies. This is especially time sensitive since the hot-season in Iraq begins ~March.**

Deliverables

- **3-Months: Procure COTS items & develop aircraft installation systems**
- **6-Month: Complete qualification testing and issue Flight-Clearance**
  - Procure assets and direct Fleet-incorporation via RAMEC

Approach

- **Integrate COTS/NDI Rugged Water Containers into transport-class helicopters.**

Technology Maturity TRL = 6

- Use currently available COTS/NDI items adapted to aviation applications for specific USN/USMC helicopters
- Similar system already in-place with military ground vehicles
- Testing and qualification will be necessary to ensure that systems and attachment devices are safe for flight (crash-safety, emergency egress, etc.)
- Chem/Bio compatibility is strongly desired
- **6-Month Goal: TRL ⇒ 8 / 9-Month Goal: TRL ⇒ 9**

Cost and Milestones

-- Procure COTS items & develop aircraft installation systems

- 3 months ($150K)

-- Complete qualification testing and issue Flight-Clearance

- 6 months (~$150K)

-- Procure assets and direct Fleet-incorporation via RAMEC (~1500 kits)

- 9+ months ($250K)

Total**: $550K / 9 mos**

Partial Funding Would Still Allow For Limited Execution of this Initiative

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Procurement of Additional Multi-Climate Protection (MCP) Ensembles for USN/USMC Aviators/Aircrews

Also submitted (but Not Yet Approved) by NAVAIR PMA-202 as POM-06 Issue

Deficiency

- **Current procurement of the USN/USMC aviators' Multiple Climate Protection (MCP) systems is insufficient to meet the needs of our personnel in the Iraqi/Afghan theaters.**

Capability Gap

- **Aircrews will have inadequate protection against cold/inclement weather**

Approach

- **Plus-up existing contracts to accelerate outfitting of all in-theater aviators/aircrew**

Technology Maturity: Current TRL = 9

- Technology is mature and assets are currently being delivered.

NAVAIR's MCP Aviator Ensemble

Deliverables

- **3-Months: Addition of additional funding to existing procurement contract**
- **6-Months: Delivery of additional ensembles to Fleet**

Cost and Milestones

Procurement of hardware (individual and multi-place bandage systems)

- 3-6 months ($1.2M)

Total**: $1.2M / 6 mos**

Partial Funding Would Still Allow For Limited Execution of this Initiative

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Incorporation of US Army's Micro-Climate Cooling Vest Systems into Limited Number of USMC Helicopters

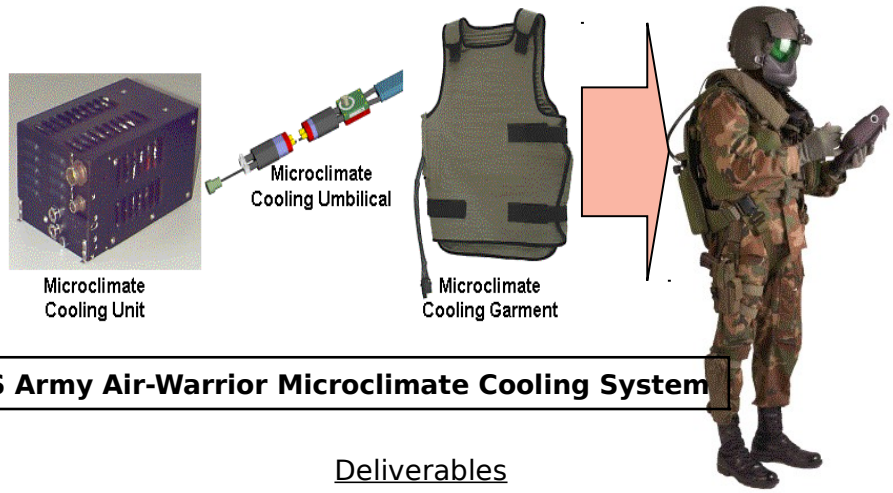
Also submitted (but Not Yet Approved) by NAVAIR PMA-202 as POM-06 Issue

Deficiency

- **Most USMC helicopters offer no means of cooling aviators/aircrews operating in hot environments**
- **This significantly impacts operational effectiveness/mission-capability by degrading aircrew performance for missions over ~3.5 hours**

Capability Gap

- **Helicopters with open/unconditioned cockpits (H-46, H-1, H-53, AH-1, most H-60s) operating in hot environments place aircrew under significant thermal stresses**
- **This is not merely a comfort issue, it is an issue of operational readiness and safety. Army testing has shown a rapid decline in performance (and increased risks of mishap-producing errors) after ~3.5 hours of operations in such environments**



US Army Air-Warrior Microclimate Cooling System

Deliverables

- **Immediate: Loan of System(s) from Army for Development of Acft/Man Integration**
- **2 Months: Procurement of Microclimate Systems**
- **6-Months: Completion of qualification-testing and start of insertion into USN/USMC aircraft/aircrew systems in Iraq/Afghanistan**

Approach

- **Piggyback on existing Army contract to procure these systems, with delivery beginning 3/04**
- **Install systems into limited number of USMC airframes with priority given to acft flying long-range missions in Iraqi/Afghan theaters**
  - Priority given to H-1 and H-60 – integration/installation has already been done by Army

Technology Maturity: Current TRL = 6/7

- Systems have been developed by the US Army and are in-production (EDD beginning March '04)
- Integration into USMC aircraft and aircrew ensembles will not be technically difficult
  - 5-Month Goal: TRL ⇒ 7-8 / 9-Month Goal: TRL ⇒ 9

Cost and Milestones

Development of Acft/Man Interfaces

- 3-5 months ($550K)

Procurement of hardware (~75 systems @$29K/system)

- 6 months ($2.175M)

Installation of systems into USMC airframes

- 9 months ($375K)

Total**: $3.1MK / 9 mos IOC**

Additional funding in out-years will allow expansion of program-scope

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Improved Hydration Systems for Post-Ejection/Post-Crash and Extended-Duration Aviation Operations – Tactical Fixed-Wing and Helicopter USN/USMC Aircraft

Deficiency

- **Aircrew flying in OIF operate in a hot dry environment for long duration flights. Current Survival Vests contain up to 50 oz hydration systems for in-cockpit use only. These hydration systems have never been evaluated to determine if they will survive ejection or crash loads.**
- **Lack of hydration systems for post-crash/post-ejection use will significantly reduce the chances for successful survival/evasion/rescue.**

Capability Gap

- **Aircrew survival water is limited to Mil Spec bagged water contained in the Survival Vest or Seat Survival Kit. This is only marginally adequate for mission requirements, and is completely unsatisfactory for post-crash/post-ejection operations.**
- **Systems may also provide for better in-cockpit hydration for improved mission effectiveness.**

Possible COTS System Under Consideration

Approach

- **Procure available COTS Hydration systems and test them under ejection and crash loads to determine which are suitable for use by aircrew for survival water use that will fit into existing space on vests**

Technology Maturity: Current TRL = 5/6/7

- **Numerous types of COTS hydration systems are available. These were designed for strenuous outdoors use and should be evaluated for use in Navy and Marine Corp aircraft and for post-mission survival.**
  - Ruggedization/customization and chem/bio compatibility will be validated/developed
  - **3-Month Goal: TRL ⇒ 8 / 7-Month Goal: TRL ⇒ 9**

Deliverables

- **Report on Market research**
- **Test report on Ejection tower and Windblast tests**
- **Hardware & Aircrew Integration Design**

Costs and Milestones

Market Research

- 1 month ($10K)

Ruggedization/Customization (if necessary)

- 2 months ($~50K)

Aircrew Integration / Qualification Tests

- 3 months ($52K)

Procure Hydration Systems for Deployed units

- 5-7 months 3,000 systems @ $50 ea =$150K

Total**: $262K / 7 mos**

Partial Funding Would Still Allow For Limited Execution of this Initiative

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Class IIA Ballistic Armor Sleeves and Chaps for Enhanced Protection of Extremities or USN / USMC Helo Aviators/Aircrews

Deficiency

- **Current military helmets and body-armor only protect the heads and torsos of soldiers/aviators.**
- **Lack of ballistic protection for limbs contributes to battlefield casualties.**

Capability Gap

- **Class IIA body armor chaps/sleeves has been developed by the private-sector. New lighter-weight ballistic materials allow fragmentation protection without weight-penalties / thermal-stressing.**

Approach

- **Provide an avenue for obtaining improved (more durable, lighter weight) armor plates for fleet users, currently available on the market.**
- **These systems will also be VERY useful for ground troops. This initiative can be easily expanded to include them as well.**
- **Class IIA body-armor can protect against .357 magnum rounds at point-blank, as well as against ALL fragmentation.**

Prototypes of Ballistic Armor Chaps as Recently Purchased by US Border Patrol

Deliverables

- **2-Months: Procure prototypes customized for USN use**
- **2-5 Months: Test & qualify prototypes, integrate with current aircrew ensembles**
- **6-9 Months: Fielding of limited numbers in-theater for real-world evaluation**
- **9+ Months: Production deliveries**

Technology Maturity: Current TRL = 5/6

- Lightweight and cooler next-generation body armor is currently on-the-market for police agencies
- 40 each sets of chaps and sleeves in Class IIA have recently been delivered to the US Border Patrol
- Integration of improved / supplemental body into current ensembles of tactical aviators will be labor-intensive, but NOT a technological challenge
- **5-Month Goal: TRL ⇒ 8 / 9-Month Goal: TRL ⇒ 9**

Cost and Milestones

Prototypes - 2 months ($80K)

Test, Qual, & Integration – 2-5 months / ($140K)

In-Theater Evaluation (Low-Risk) - 5-8 months ($100K)

Delivery of Improved/Supplemental Armor Systems - 9-12 months ($900K)

Total**: $1,220K / 9 mos 'til IOC**

Partial Funding Would Still Allow For Limited Execution of this Initiative

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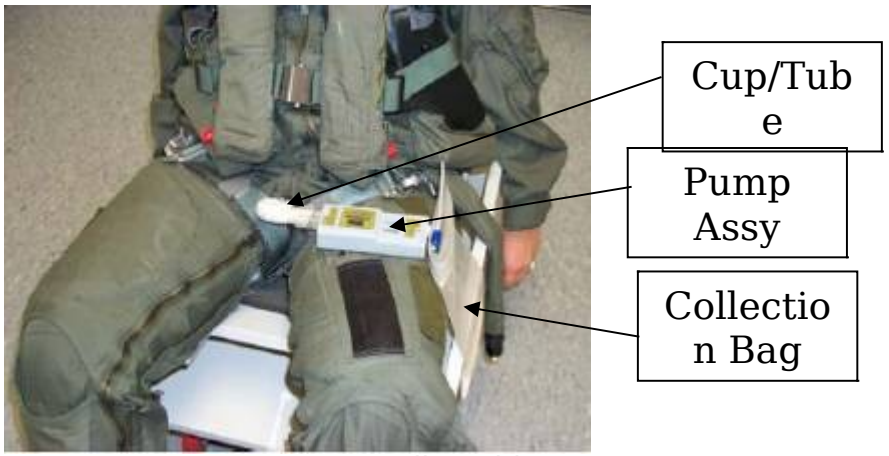
Improved Mission Effectiveness and Operational Endurance for USN/USMC Tactical Aviators – Advanced Bladder Relief Device (ABRD)

Deficiency

- **Current operations in Afghanistan and Iraq have involved much prolonged missions for USN/USMC aviators (8+ hour missions have become routine)**
- **Current systems for in-cockpit bladder relief greatly impair the ability to fly the airplane**
  - At least two near-mishaps have resulted from awkwardly-executed in-cockpit bladder relief activities
- **Lack of effective means for bladder relief is resulting in aviators purposefully dehydrating themselves prior to flight operations**
  - Purposeful dehydration degrades mission effectiveness



Capability Gap

- **Bladder relief systems for in-cockpit use are limited to "diapers" and "trucker's friend" bottles/bags**
- **Although this is a problem for male aviators, it is a greater problem for female aviators**

Approach

- **Procure recently-developed ABRDs from commercial source**
  - Systems are customized for both male and female aviators
- **Integrate system into current aircrew ensemble**

Technology Maturity: Current TRL = 7

- 4-Month Goal: TRL ⇒ 8 **System has been prototyped by Omni Measurement Systems under USAF SBIR program**
- 6-Month TRL Goal ⇒ 9 **Qualification and integration are pending funding**

Deliverables

- **Immediately: Procure prototypes**
- **1-2 Months: Integration into aviator's ensemble**
- **2-4 Months: Qualification testing**
- **6-12 Months: Production assets**

Cost and Milestones

Integration into USN/USMC aviators' ensembles
- 2 months ($60K)
Qualification, environmental, and safety testing
- 4 months ($250K)
Integrated logistics support
- 6-12 Months ($120K)
Hardware Systems (2000 units = 300,000 missions)
- 6-12 months ($8.38M)
Total**: $8.81M / 6 months until IOC**

Partial Funding Would Still Allow For Limited Execution of this Initiative, Although Lower Hardware Quantities Will Increase Unit Costs

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Low Signature Defensive Weapon Systems for Downed USN/USMC Aviators/Aircrews to Use in Escape and Evasion Activities

Deficiency

- **Downed aviators/aircrew cannot defend themselves during escape&evasion activities without revealing their positions to nearby enemy troops/searchers**
  - Identified as deficiency by aviators at 2003 Operators' Advisory Group (OAG)

Capability Gap

- **Downed USN/USMC aviators/aircrew have limited capability for self-defense, limited to conventional weapons (i.e. knife / pistol)**
  - Pistol has loud report and flash, almost certainly alerting enemy searchers of the evader's presence/position upon use
  - Knife is extremely short-ranged, and is truly effective only for those who have been trained in its combat use

Possible Candidate Items Include: Chemical Sprays, High-Voltage Electrical (I.e. Taser), and Silenced Conventional Weapons

Deliverables

- **1-2 Months: Technology survey**
- **3 Months: Procure sample assets for testing**
- **5-6 Months: Develop integration of systems into current USN/USMC aviator's ensemble**
- **7-11 Months: Production deliveries to in-theater aviators**

Approach

- **Identify/develop a COTS/NDI system or device that can render an enemy security forces ineffective**
  - Without alerting other nearby enemy assets while downed aviators are evading troops in enemy territory
- **Focus will be upon covert and non-lethal systems**

Technology Maturity: Current TRL = 6

- **Research chemical sprays, ultrasonics, blinding/ disabling lasers, stun guns, etc.**
  - USMC Non-Lethal Weapons Program has already done much work in this area
- **Research available COTS/NDI weapons used by law enforcement officials and/or special operations troops**
- **Integrate these weapons into the aircrew's flight ensemble**
- 4-6 Month Goal: TRL ⇒ 8 / 7-11 Month Goal: TRL ⇒ 9

Cost and Milestones

Tech Survey
- 1-2 months ($20K)
Sample Asset Receipt
- 3 months ($15K)
Test / Qual Report of Candidate Systems
- 4-6 months ($45K)
Development of Integration with Ensemble
- 6-7 months ($60K)
Delivery of Production Assets
- 7-11 months ($400K)
Total**: $540K / 7-11 mos 'til IOC**
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